

AMENDMENTS TO THE CLAIMS

The following listing of claims will replace all prior versions and listings of claims in the application.

LISTING OF CLAIMS

1. (Currently Amended) A device for short-cycle arc welding of an element to a component, the device comprising:

a positioning mechanism;

a welding head positionable relative to the component by the positioning mechanism, the welding head having a chucking mechanism operably holding the element, a motion mechanism operably advancing and retracting the chucking mechanism relative to the welding head; and

a feed channel operably feeding the element to be welded into the chucking mechanism by use of gas pressure, at least a segment of the feed channel extending through the motion mechanism and being coaxially aligned with the chucking mechanism; and

the chucking mechanism being movable between an open position, which permits axial passage of the element from the feed channel through the chucking mechanism, and a chucking position, in which the element is chucked;

wherein the chucking mechanism in the open position creates a free passage for the element to be welded from the feed channel and out of the welding head;

the chucking mechanism further comprising an axially movable clamping nosepiece that works together with the chucking elements to move them between the open and chucking positions;

the chucking mechanism further comprising a plurality of angled surfaces operably coupling the clamping nosepiece and the chucking elements together in order to convert an axial displacement of the clamping nosepiece into one of a chucking and a release motion of the chucking elements;

the chucking elements having an approximate wedge shape and being extendable toward the clamping nosepiece; and

a clamping nut locatable on a chucking element side facing away from the clamping nosepiece movably retaining the chucking elements.

2. (Currently Amended) The device of claim 1, ~~wherein the chucking mechanism comprises an axially movable clamping nosepiece that works together with the chucking elements to move them between the open and chucking positions~~ further comprising a movable robotic arm and an element storage device mounted on the arm, the arm operably moving the welding head.

3. (Cancelled)

4. (Currently Amended) The device of claim ~~[[2]]~~ 1, wherein the ~~clamping nosepiece further comprises an axially movable~~ clamping nosepiece is movable toward the feed channel in order to move into the chucking position.

5. (Currently Amended) The device of claim [[2]] 1, further comprising a conically shaped inner surface positionable on a plurality of outer angled surfaces on the chucking elements, the inner surface acting with the clamping nosepiece.

6. (Currently Amended) The device of claim [[2]] 1, wherein the chucking elements further comprise a plurality of self-centering chucking elements.

7. (Cancelled)

8. (Currently Amended) The device of claim [[2]] 1, comprising a drive ~~provided for~~ operably bracing the clamping nosepiece against the chucking elements.

9. (Original) The device of claim 8, wherein the drive comprises a linear motor.

10. (Original) The device of claim 8, wherein the drive comprises a fluid cylinder.

11. (Currently Amended) The device of claim [[8]] 1, further comprising a ~~motor drive, selectable as a linear motor~~[[,]] provided on the ~~linear~~ motion mechanism ~~for each of~~ operably advancing and retracting the chucking mechanism.

12. (Currently Amended) The device of claim 1, further comprising a pressure sensor provided to monitor a pressure inside the clamping mechanism, a signal

therefrom being provided to an analysis unit for analysis in order to emit a signal that is characteristic of the feeding of ~~an~~ the element to a surface of the component ~~surface~~.

13. (Currently Amended) The device of claim 1, further comprising a measurement voltage applicable between the chucking mechanism and the component, the measurement voltage suppliable to an analysis unit for analysis in order to emit a signal that is characteristic of the feeding of ~~an~~ the element to a surface of the component ~~surface~~.

14. (Previously Presented) A device for short-cycle arc welding of an element to a component, the device comprising:

a positioning mechanism;

a welding head positionable relative to the component by the positioning mechanism, the welding head having a chucking mechanism operably holding the element, a motion mechanism operably advancing and retracting the chucking mechanism relative to the welding head;

a feed channel operably feeding the element to be welded into the chucking mechanism;

the chucking mechanism being movable between an open position, which permits axial passage of the element from the feed channel through the chucking mechanism, and a chucking position, in which the element is chucked;

wherein the chucking mechanism in the open position creates a free passage for the element to be welded from the feed channel and out of the welding head;

an intermediate storage; and

a storage device;

wherein the feed channel is coupled through the intermediate storage to the storage device, the storage device feeding the elements to be welded.

15. (Original) The device of claim 14, comprising a maximum distance of one meter separating the intermediate storage from the workpiece opening of the chucking mechanism.

16. (Original) The device of claim 14, comprising a maximum distance of 0.5 meters separating the intermediate storage from the workpiece opening of the chucking mechanism.

17. (Original) The device of claim 14, comprising:
a chamber of the intermediate storage for accommodating an element to be welded, the element having closed axial ends; and
a plurality of pneumatic closures operable to close the closed axial ends.

18. (Original) The device of claim 17, comprising at least one sensor for stud length detection provided in the chamber.

19. (Original) The device of claim 17, comprising a feed line for feeding a gas into the chamber and an exhaust line for removing the gas from the chamber, each of which is controllable by a valve open onto the chamber.

Claims 20-26 (cancelled).

27. (Currently Amended) An arc welding system comprising:

a welding head positionable relative to a workpiece, the welding head having a chucking mechanism engageably holding an element, a first linear actuator operable to radially open and close the chucking mechanism, and a second linear actuator operable to advance and retract the chucking mechanism relative to the welding head; and

a feeding channel extending through both of the actuators;

the chucking mechanism including a plurality of radially movable chucking elements, each radially displaceable in response to an axial displacement of the first linear actuator between an open position, permitting free axial passage of the element through the chucking device, and a chucking position, having the element chucked between the chucking elements;

wherein after the element passes freely through the chucking device and contacts the workpiece, and the first linear actuator displaces in a first axial direction to position the chucking elements in the chucking position, the second linear actuator subsequently displaces longitudinally in a second axial direction toward the workpiece, opposite the first axial direction, and advances the element for welding.

28. (Original) The arc welding system of Claim 27, comprising a conical nosepiece connectable to the first linear motion mechanism, the conical nosepiece

positionable to directly contact the chucking elements to radially displace the chucking elements upon displacement of the first linear motion mechanism in the first direction.

29. (Currently Amended) An arc welding machine, comprising:

a welding head having a chucking mechanism operably holding one of a plurality of elements to be welded, a first motion mechanism operable to radially open and close the chucking mechanism, and a second motion mechanism operably advancing and retracting the chucking mechanism relative to the welding head;

a positioning mechanism remote from the welding head to position the welding head;

a movable robotic arm member joining the welding head to the positioning mechanism;

a storage chamber secured to and always moving with the robotic arm member, when the member moves, the storage chamber being operable to temporarily store individual ones of the elements to be welded; and

a feed channel providing the element to the welding head, the feed channel being in communication with the storage chamber.

30. (Original) The machine of Claim 29, comprising a storage device positionable remote from both the welding head and the storage chamber, the storage device operable to store for transfer to the storage chamber the elements to be welded.

31. (Original) The machine of Claim 30, comprising a feed line linking the storage device to the storage chamber.

32. (Previously Presented) A welding head for engaging individual items, the welding head comprising:

a chucking mechanism operable to hold one of the items, the chucking mechanism including a plurality of radially movable chucking elements;

a first electromagnetic mechanism operable to radially open and close the chucking mechanism;

a substantially conical-shaped nosepiece connectable to the first mechanism, the nosepiece positionable in direct contact with the chucking elements to radially displace the chucking elements;

a second electromagnetic mechanism operable to longitudinally advance and retract the nosepiece; and

a feed channel disposed through the welding head and through at least one of the electromagnetic mechanisms to deliver the items to the chucking mechanism.

33. (Original) The welding head of Claim 32, further comprising:

an inner cylinder connectable to the second mechanism;

an outer cylinder connectable to the first mechanism, the outer cylinder positioned external to the inner cylinder; and

at least one sleeve bearing positioned between the inner and outer cylinders to permit a sliding engagement of the inner cylinder and the outer cylinder.

34. (Previously Presented) The welding head of Claim 32 further comprising:
a workpiece;
the items including a weld stud; and
a controller connected to at least one of the electromagnetic mechanisms,
the controller automatically controlling at least one of the electromagnetic mechanisms
to subsequently cause the chucking mechanism to apply a pulling force on the weld
stud in a direction away from the workpiece to which it has been welded, in order to test
the weld strength.

35. (Previously Presented) The welding head of Claim 32 further comprising:
an analysis unit operably monitoring welding element-clamping force of
the chucking mechanism as a function of a characteristic of at least one of the
electromagnetic mechanisms.

36. (Previously Presented) The welding head of Claim 32 further comprising:
a feeder adapted to move the items to the chucking mechanism by use of
gas pressure; and
a sensor operably monitoring the gas pressure adjacent the chucking
mechanism.

37. (Previously Presented) The welding head of Claim 32 wherein the
chucking mechanism comprises an axially movable clamping nosepiece that works
together with the chucking elements to move them between the open and chucking
positions.

38. (Previously Presented) The welding head of Claim 37 further comprising:
the chucking elements having an approximate wedge shape and being extendable toward the clamping nosepiece; and
a clamping nut locatable on a chucking element side facing away from the clamping nosepiece for movably retaining the chucking elements.

39. (Previously Presented) The welding head of Claim 32 comprising:
an intermediate storage;
a storage device; and
a feed channel coupled through the intermediate storage to the storage device, the storage device feeding the elements to be welded.

40. (Previously Presented) An arc welding system comprising:
a workpiece;
a weld stud;
a feeding tube;
a welding head including chucking members movable from a welding stud-engaging position to an open position; and
gas pressure causing the weld stud to sequentially move through the feeding tube, through at least part of the welding head and at least partially extending external to the welding head;

wherein the weld stud contacts against the workpiece prior to engagement by the chucking members and at least part of the weld stud remains within the nosepiece before chucking.

41. (Previously Presented) An arc welding system comprising:
chucking members movable from a weldable member-engaging position to an open position;
a first electromagnetic actuator operably moving the chucking members;
a nosepiece located adjacent the chucking members, the nosepiece having an opening adapted to allow weldable element-passage therethrough; and
a second electromagnetic actuator operably advancing and retracting the nosepiece substantially independently of the chucking members;
wherein the nosepiece is retractable away from a workpiece position before the chucking members are in their fully engaging positions.

42. (Previously Presented) The system of Claim 27 wherein the actuators are electromagnetic actuators and the feeding channel is coaxially aligned with the chucking mechanism.

43. (Previously Presented) The system of Claim 27 wherein the actuators are coaxially aligned with each other.

44. (Currently Amended) The system of Claim 27 further comprising weld studs fed through the channel, and the channel being a separate and substantially tubular part coupled to the welding head.

45. (New) The system of Claim 40 wherein the welding head further comprises at least two linear electromagnetic actuators, one of the actuators moving the nosepiece and the other of the actuators closing the chucking members.

46. (New) The system of Claim 41 further comprising:
a workpiece;
the element including a weld stud; and
a controller connected to at least one of the electromagnetic actuators, the controller automatically controlling at least one of the electromagnetic actuators to subsequently cause the chucking members to apply a pulling force on the weld stud in a direction away from the workpiece to which it has been welded, in order to test the weld strength.

47. (New) The system of Claim 41 further comprising:
an analysis unit operably monitoring weldable element-clamping force of the chucking members as a function of a characteristic of at least one of the electromagnetic actuators.

48. (New) The system of Claim 41 further comprising:
a feeder moving the weldable element to the chucking members by use of gas pressure; and
a sensor operably monitoring the gas pressure adjacent the chucking members.
49. (New) The system of Claim 41 further comprising:
the chucking member having an approximate wedge shape and being extendable toward the nosepiece; and
a clamping nut locatable on a chucking member side facing away from the nosepiece for movably retaining the chucking members.
50. (New) The system of Claim 41 comprising:
a movable intermediate storage;
a stationary storage device; and
a feed channel coupled through the intermediate storage to the storage device, the storage device feeding the element to be welded.